MUNICIPAL AND COMMUNITY GREENHOUSE GAS INVENTORY

FINAL REPORT

March 31, 2009

Performed by Riki Anne Lanegan, LEED AP
Sustainability Program Manager
City of Lincoln City
Lincoln City, Oregon

List of Figures

List of Tables

1. INTRODUCTION

A. Purpose of Document

As part of the adoption for the Lincoln City Sustainability Plan (Exhibit A) of Resolution No. 2007-29, June 25th, 2007, and in conformance for the creation and implementation of a Long-term Action Plan, this report on the Inventory of Greenhouse Gases (GHGs) for the City of Lincoln City is hereby submitted. As such, it fulfills the assessment phase for such a plan in the environmental concerns of Building Energy Usage, Transportation, Water Treatment, Wastewater Treatment and Waste. It also forms the baseline measurement and quantification for Lincoln City's contribution to global warming as of a particular baseline measurement year. This analysis of global warming contribution along with possible future mitigation efforts performed by the city, will form the level of effort to which the municipality will implement an effective, legitimate, measurable, and attainable Local Climate Action Plan to help stop global warming and its long term effects on our planet. The Local Climate Action Plan will then be a supplement, and therefore an integral part of the city's Long-term Action Plan for sustainability.

B. Background on Climate Change

The following narrative is taken from the 2007 Greenhouse Gas Inventory of Springfield, Oregon:

"Every year since 1997 has been in the Top 10 list of hottest years in recorded history, with 2005 deemed the warmest on record. Average global temperatures have risen by one degree Fahrenheit since the late 19th century. Globally, the warming in the 20th century is the largest of any century during the past thousand years and is roughly as warm as the Earth has been at any time in the last 420,000 years. A scientific consensus exists that natural processes cannot explain the increased temperature. The primary cause is the accumulation of human-produced greenhouse gasses such as carbon dioxide and methane (and other human activities such as deforestation). A growing number of scientists are also concerned that more than a 3-4 degree Fahrenheit temperature increase above pre-industrial levels may generate immense and possibly irreversible worldwide economic, social and ecological impacts, including here in the Pacific Northwest.

Although climate change is driven in large part by the global emission of greenhouse gasses, the impacts will be felt at the local level. Similarly, although action is required across the globe to resolve the problem, many solutions to climate change must begin with local communities. Local governments, therefore, are ground zero for responding to climate change."

The following narrative is taken from the 2006 Boulder County, Colorado Greenhouse Gas Inventory Report, and represents case study for Lincoln City as a similar tourist-based economy:

"Fundamental to any comprehensive plan to respond to climate change is the development of an emissions inventory that identifies and quantifies the primary anthropogenic sources of greenhouse gases (GHG). As such, a comprehensive GHG inventory and an accompanying inventory maintenance system have been developed for Boulder County. This inventory adheres to both 1) a comprehensive and detailed methodology for estimating sources of GHGs, and 2) a common and consistent methodology to compare the relative contribution of different emission sources and greenhouse gases to climate change. The overarching philosophical framework within which Boulder's GHG inventory was developed is that the County Commissioners recognize and acknowledge the environmental imperative that man-made climate change is real, it is happening now, and decisive action must be taken to mitigate it. Man-made climate change, in fact, is recognized as a direct threat to the very lifeblood of Boulder County, as capsulated in statements contained in the summer 2002 edition of US EPA's biannual report to the United Nations on climate change: "snow-fed streams in the USA will be permanently diminished" and "alpine meadows in the US Rocky Mountains will permanently disappear" as the result of man-made climate change.

Clearly, Boulder County's water supply, quality of life, and tourism industry are threatened by climate change. The first step in the GHG planning process is to develop a clear picture of historical and current sources and magnitudes of Boulder County's GHG emissions. In general, the process for developing a GHG emissions inventory and inventory management system involves 1) the development of a historical inventory of GHG emissions for the period of 1990 through the present; 2) development of a projected Business-As-Usual (BAU) emissions trend line out to 2012, based on the historical emissions data; 3) disaggregating of the overall inventory into sector- and source-specific emissions. This document reports the results of the Boulder County GHG Inventory. The results of the work provide insight into the magnitude of the challenge facing Boulder County with respect to the County's Kyoto goal of achieving emissions by 2012 that are 7% below the 1990 level.

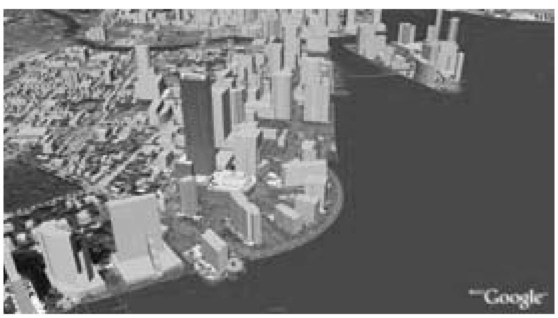
It comes as no surprise that meeting this goal will be a daunting enterprise requiring substantial community mobilization, substantial County government commitment, and substantial budgets."

The following text, charts and images are excerpts taken from the coastal impact study from the Architecture2030 publication "*Nation Under Siege: Sea Level Rise on Our Doorstep*", 2030 Inc., Sept. 2007. It outlines what the coastal devastation would be due to the global climatic effects of sea level rise brought about by the disintegration and melting of Artic and Antarctic ice sheets.

"As can be seen from the following images[1], a sea level rise of even one meter has serious consequences for the US. Our nation will be physically under siege, vulnerable to catastrophic property and infrastructure loss with large population disruptions and economic hardship."

Effected area due to a 1.75m sea level rise for Honolulu, Hawaii.

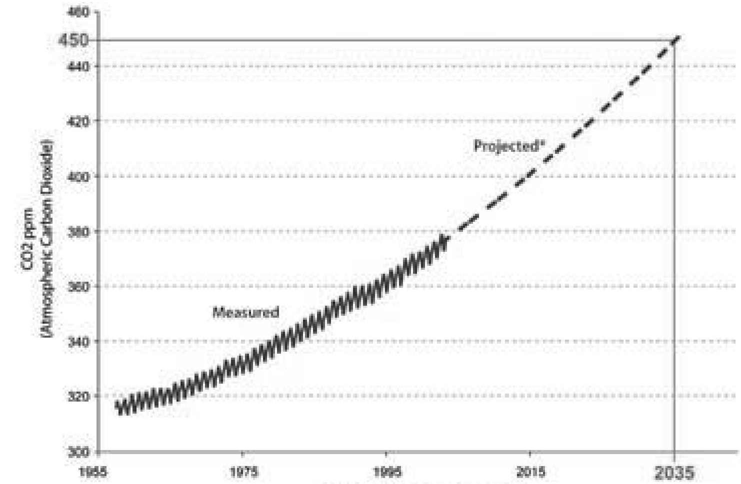
Effected area due to a 1.25m sea level rise at the San Francisco International Airport.



Effected area due to a 1.25m sea level rise at Miami, Florida.

Effected area due to a 3m sea level rise at Boston, Massachusetts.

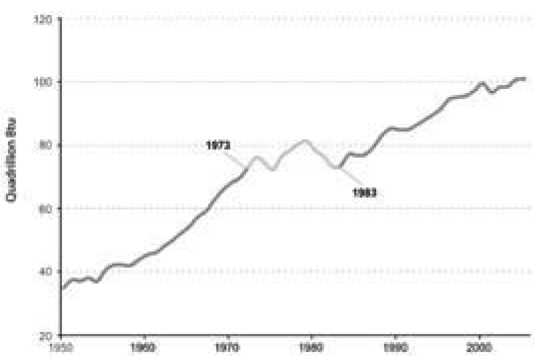
Similar effects will no doubtedly be felt in Lincoln City, Oregon.



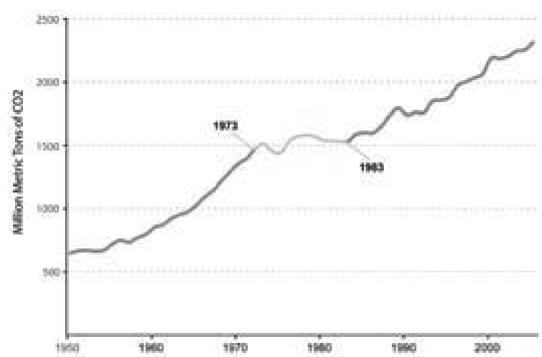
ATMOSPHERIC CO2 TREND

Source: Adapted from Scripps Institution of Oceanography and National Oceanic and Atmospheric Administration
1958-1974 Scripps Institution of Oceanography
1974-2006 National Oceanic and Atmospheric Administration
*2006-2035 2030, Inc.: Projected trend based on Atmospheric CO2 as measured at Mauna Loa Observatory

"Scientists are now forewarning that, at approximately 450 parts per million (ppm) CO_2 in the atmosphere, we will trigger potentially irreversible glacial melt and sea level rise "out of humanity's control". We are currently at 383 ppm, and are increasing atmospheric concentrations of CO_2 at about 2 ppm annually. Continued growth of CO_2-producing infrastructure and emissions for another 10 years will make it impractical, and most likely impossible, to avert exceeding the 450 ppm threshold."



US ENERGY CONSUMPTION 1950-2005
Source: Based on Energy Information Administration data



US RESIDENTIAL AND COMMERCIAL BUILDING OPERATIONS
CO2 EMISSIONS 1950-2005
Source: Based on Energy Information Administration data

"During the 1970's oil crisis (an 11-year period from 1973 to 1983), this country, drawing on American determination and ingenuity, increased its real GDP by over one trillion dollars and added 30 billion square feet of new buildings and 35 million new vehicles, while decreasing total US energy consumption and CO_2 emissions. This was accomplished with increased efficiency and with cost-effective, readily available, off-the-shelf materials, equipment and technology."

2. APPROACH

The approach, which has been taken by the City of Lincoln City, is to adhere to the Cities for Climate Protection Campaign (CCP) under the globally accredited and recognized authority, ***ICLEI - Local Governments for Sustainability***. Under this program, and as a member of *ICLEI – Local Governments for Sustainability*, the City of Lincoln City has adopted their recommended ***5 Milestones for Climate Protection Program.***

1. Conduct a baseline emissions inventory and forecast

   The city first calculates greenhouse gas emissions for a base year (e.g., 2000) and for a forecast year (e.g., 2015). The calculations capture emissions levels from all municipal operations (e.g., city owned and/or operated buildings, streetlights, transit systems, wastewater treatment facilities) and from all community-related activities (e.g., residential and commercial buildings, motor vehicles, waste streams, industry). This inventory and forecast provide a benchmark for planning and monitoring progress.

2. Adopt an emissions reduction target for the forecast year

   The city passes a resolution establishing an emissions reduction target for the city. The target is essential. It both fosters political will and creates a framework that guides the planning and implementation of measures.

3. Develop a Local Climate Action Plan

   The local government then develops a Local Climate Action Plan, ideally with robust public input from all stakeholders. The plan details the policies and measures that the local government will take to reduce greenhouse gas emissions and achieve its emissions reduction target. Most plans include a timeline, a description of financing mechanisms, and an assignment of responsibility to departments and staff. In addition to direct greenhouse gas reduction measures, most plans also incorporate public awareness and education efforts.

4. Implement policies and measures

   The city implements the policies and measures contained in their Local Climate Action Plan. Typical policies and measures include energy efficiency improvements to municipal buildings, water and wastewater treatment facilities, streetlight retrofits, public transit improvements, installation of renewable power applications, and methane recovery from waste management.

5. Monitor and verify results

   Monitoring and verifying progress on the implementation of measures to reduce or avoid greenhouse gas emissions is an ongoing process. Monitoring begins once measures are implemented and continues for the life of the measures, providing important feedback that can be used to improve the measures over time. ICLEI's software provides a uniform methodology for cities to report on such measures.

In fulfilling the requirements for Milestone 1, this inventory used the software developed by Torrie Smith Associates for the State and Territorial Air Pollution Program Administrators and the Association of Local Air Pollution Control Officials (STAPPA/ALAPCO) and the International Council for Local Environmental Initiatives (ICLEI) called Clean Air and Climate Protection Software (CACP) Version 1.1, June 2005.

As taken from the CACP Version 1.1 User's Guide:

"The Clean Air and Climate Protection (CACP) Software calculates the greenhouse gases and criteria air pollutants produced by energy use and solid waste disposal, and helps you quantify measures designed to reduce these emissions."

"The software takes data you provide on energy use and energy use reductions and converts it to emissions using specific emission factors (coefficients) that relate the emissions of a particular pollutant (e.g. carbon dioxide) to the quantity of the fuel used (e.g. kilograms of coal)."

In quantification of each of the pollutants, the CACP software reports the levels of CO_2e or "carbon dioxide equivalent" for carbon dioxide (CO_2), nitrous oxide (N_2O) and methane (CH_4) along with the following Criteria Air Pollutants (CAPs), according to the pollutants identified in the 1990 Kyoto Protocol: sulfur oxides (SO_x), nitrogen oxides (NO_x), 10 micron particulate matter (PM_{10}), HFC-23, HFC-125, HFC-134a, HFC-152a, perfluoromethane (CF_6), perfluoroethane (C_2F_6), volatile organic compounds (VOCs) and carbon monoxide (CO). The emissions designation "CO_2e" is the total greenhouse gas emissions resulting from all energy consumed, fuel used, and landfilled waste generated by the community. The Global Warming Potential (GWP) is a normalized factor that each pollutant is rated by for its molecule-for-molecule constituent effect on atmospheric global warming. Since CO_2 is the largest pollutant in quantity emitted by human activity, it is assigned a GWP value of 1. CH_4 has a GWP value of 12. NO_2 has a GWP value of 114. HFC-23, a hydrofluorocarbon, has a GWP value of 270.[1]

1. As taken from Hwww.wikipedia.comH for the definition of Global Warming Potential, Feb. 2009.

3. METHODOLOGY

The methodology is essentially the same as that taken from the Springfield Greenhouse Gas Inventory Report of January 2007, and is restated here, with applicable elements changed and adapted for the City of Lincoln City:

A. Overview

An inventory of greenhouse gas emissions for a community involves four main steps:

1. Define the goal and scope of the inventory.

2. Collect GHG emissions data.

3. Calculate GHG quantities and convert to CO2e equivalents.

4. Interpret inventory.

Step 1: Define the Goal and Scope of the Inventory

Defining the goal and scope of the inventory at the outset helps ensure that the methodology used and the data gathered are appropriate for the ultimate use of the inventory. Some important issues to consider include the overall goal, target audience, geographic boundary, and timeframe.

The standard approach is to collect emissions data for a baseline year, an interim year, and a forecast year. Setting a baseline year allows a community to establish a reference point against which to measure changes in greenhouse gas emissions over time. For this inventory, 2006 is the baseline year and 2010, 2014, and 2018 are the recommended interim years. Each follow-on interim year inventory will need to be performed after meaningful data collection sources have been identified and established by this inventory, which will provide for a consistent application of analysis across base and interim inventories. A forecast year is an estimate of emissions that would be produced in the future if no new reduction measures were taken, the so called “Business-As-Ususal” or BAU model.

The baseline indicates the starting point of the “business as usual” scenario for the community at the start of a GHG inventory process. Baselines are often mandatory for entities participating in a climate change registry or a carbon cap and trade program. The key issue in setting a baseline year is data availability. There must be sufficient and reliable data for each sector for the baseline year to calculate emissions. However, if a complete dataset is not available, it is possible to use historical trends and data from nearby years to estimate emissions for the baseline and interim years.

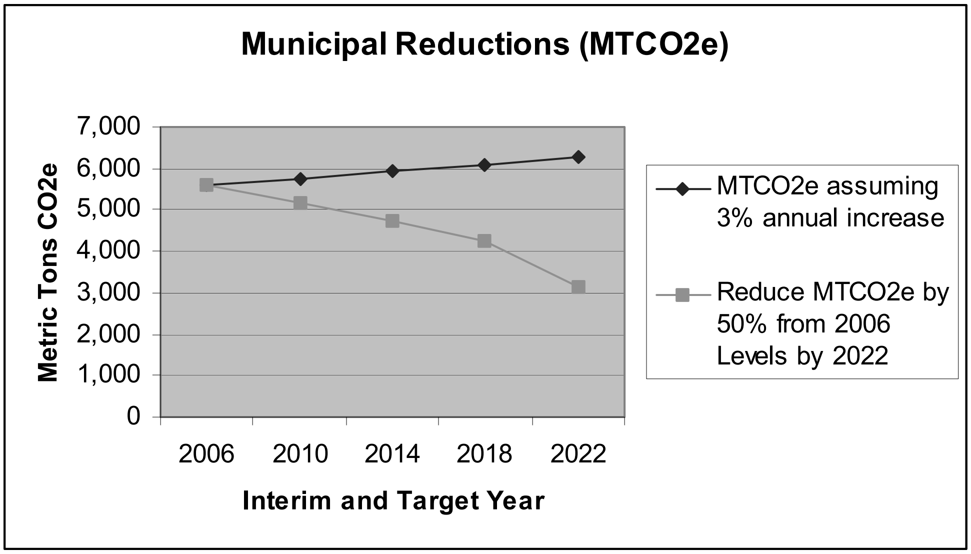


Figure 1. Hypothetical Forecast BAU Model

The above figure is only a hypothetical BAU Model for a municipal reductions forecast, is depicted only for illustrative purposes, and does not represent actual results from an actual BAU study. A BAU study and target forecasting component was not a part of this phase of the inventory, and a follow-on target year with interim years will need to be established as part of developing a Local Climate Action Plan.

Due to the urgency of action required to have any appreciable effect on the reduction of global warming, the recommended target year should be at least 2020, and aggressive reduction measures should then be established based on this year. A similar BAU Model can also be established for the community-level effort for greenhouse gas reduction targeted for the same year.

Step 2: Collect GHG Emissions Data

The next step is to identify and record the quantities and activities associated with the release of GHGs. The inventory is split between two major analysis elements: Government-based emissions and Community-based emissions. It is important to note that Government-based emissions are a subset of, and are therefore included within, the Community-based emissions.

Government emissions analysis focus on five primary emission sources responsible by local municipal activities and services: Buildings and Facilities, Vehicle Fleet, Streetlights, Water and Sewer, Waste, and Employee Commute.

Community GHG inventories generally focus on three primary emission sources: energy consumption, vehicular transportation, and waste generation. Emissions from energy consumption are disaggregated into residential, commercial and industrial sectors, which are further broken down by fuel source. Emissions from the transportation sector are broken down by fuel source, generally limited to gasoline and diesel fuel (although some communities also document emissions from biodiesel, propane and other less prevalent fuel sources). Carbon emissions from solid waste, which are due to the release of methane from landfills, are identified by type of waste (e.g., food, paper, plant debris, etc.). Instructions for each of these sectors are detailed in Appendix A.

Inventories generally do not cover GHGs and emission sources considered to be insignificant and/or not readily influenced by local government actions. A general rule that many communities follow is to exclude emissions sources that comprise a small component (generally 5% or less) of total emissions. Excluded emission sources often include aircraft and locomotive transportation, agricultural enteric and manure sources, solvent use, land use and forestry, and industrial emissions not associated with energy. Community-level inventories also tend to exclude the emissions related to the production of most goods bought or consumed in the community ("indirect" sources).

However, the exclusion of these "minor" emission sources (e.g., methane and nitrous oxides from agricultural activity) may not provide an accurate picture of local GHG emissions, as some greenhouses gases are much more potent than others (see discussion of *Global Warming Potential* below).

Some inventories account for carbon sinks such as sequestration, although that analysis is generally beyond the scope of a community-wide inventory. The rationale for excluding carbon sinks is that the appropriate data is often not available and the methodology for measuring carbon sinks can be complicated, data-intensive, and difficult to interpret.

There are two general approaches to collecting GHG data:

1. **Top-down**: uses more general information (e.g., energy use data from the county or state to estimate local energy consumption). This approach simplifies the calculation of GHG emissions and requires less time and effort. However, it is less accurate.

2. **Bottom-up**: summarizes detailed data consumption information from each local source (e.g., energy use data from each electric utility serving a community). This approach allows for a much more detailed and accurate analysis but requires significantly more time and effort.

To the extent that more accurate local information is available, a bottom-up approach is preferable. However, it may be necessary and desirable to use a combination of these approaches, depending on the availability of local data, resources and the desired specificity. Appendix A provides more information on these two approaches.

Step 3: Calculating Emissions

The next step is to calculate quantities of greenhouse gases and convert them to their CO_2 equivalents (CO_2e).

To calculate CO_2e, all units of energy (e.g., kilowatt-hours, gallons, therms, etc.) must first be standardized by converting to million metric British Thermal Units (MMBTU). This is done by multiplying each consumption figure by the appropriate conversion factor to determine energy consumption in MMBTU. (Solid waste figures remain in tons). The ICLEI supplied conversion factors are documented within the CACP program.

Next, these energy units, now expressed as MMBTU, are multiplied by a CO_2 emissions coefficient to calculate total metric tons CO_2e ($MTCO_2e$). The coefficient for electricity varies depending on the year and the mix of power used to generate electricity. For waste, a CO_2 emissions coefficient is multiplied by metric tons to calculate the total metric tons CO_2 emissions equivalent, using a different coefficient for each type of waste.

Step 4: Interpret Results

The results of the inventory identify aggregate GHG emissions and highlight which sources are the greatest contributors. A local government can then use these results to set a greenhouse gas reduction target, and develop a Local Climate Action Plan for meeting this target based on quantifiable reductions measures, uniquely applied for its ecological, economical and social considerations. The inventory can also be used as a baseline to track progress in meeting the plan's goals throughout the interim data collection and inventory reporting periods. **It is highly recommended that inventories be performed on a regular basis to evaluate the results of efforts to reduce GHG emissions and to track progress towards the reduction goal.** The results of GHG inventories may also be used to establish compliance with carbon regulations and/or determine carbon credits for entities participating in cap and trade programs.

4. INVENTORY RESULTS

The methodology described in Section 2 was used to prepare the greenhouse gas inventory for Lincoln City. With a population of 7,640 in base year 2006, Lincoln City is the second largest city in Lincoln County next to Newport.

For the base year of 2006, the municipality of Lincoln City generated approximately 5,594 metric tons of $C0_2e$ emissions. The Water and Sewage sector accounted for the highest percentage of emissions at 50 percent. CO_2e emissions from the Building and Facilities sector was second at 22 percent, followed by Streetlights at 11 percent, Waste at 8 percent, Vehicle Fleet at 6 percent, and finally Employee Commute at 3 percent.

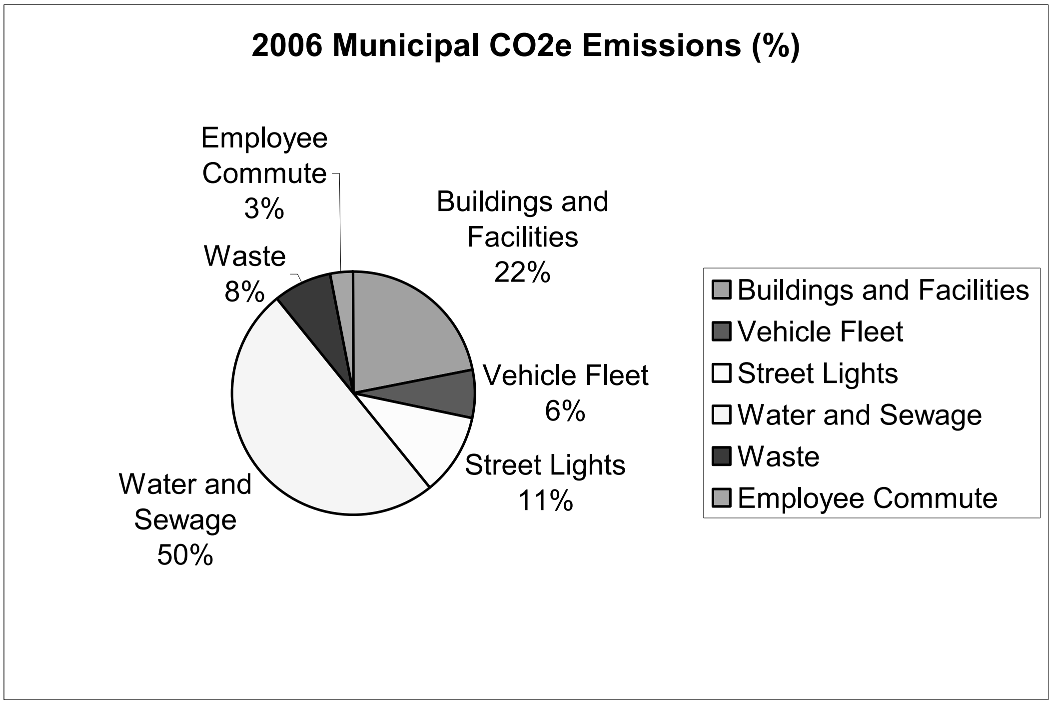


Figure 2. 2006 Municipal CO_2e Emissions by Sector (%)

Municipal Sector	MTCO2e
Buildings and Facilities	1,234
Vehicle Fleet	353
Streetlights	610
Water and Sewage	2,788
Waste	436
Employee Commute	174
TOTAL	5,594

Table 1. 2006 Municipal CO_2e Emissions by Sector ($MTCO_2$e)

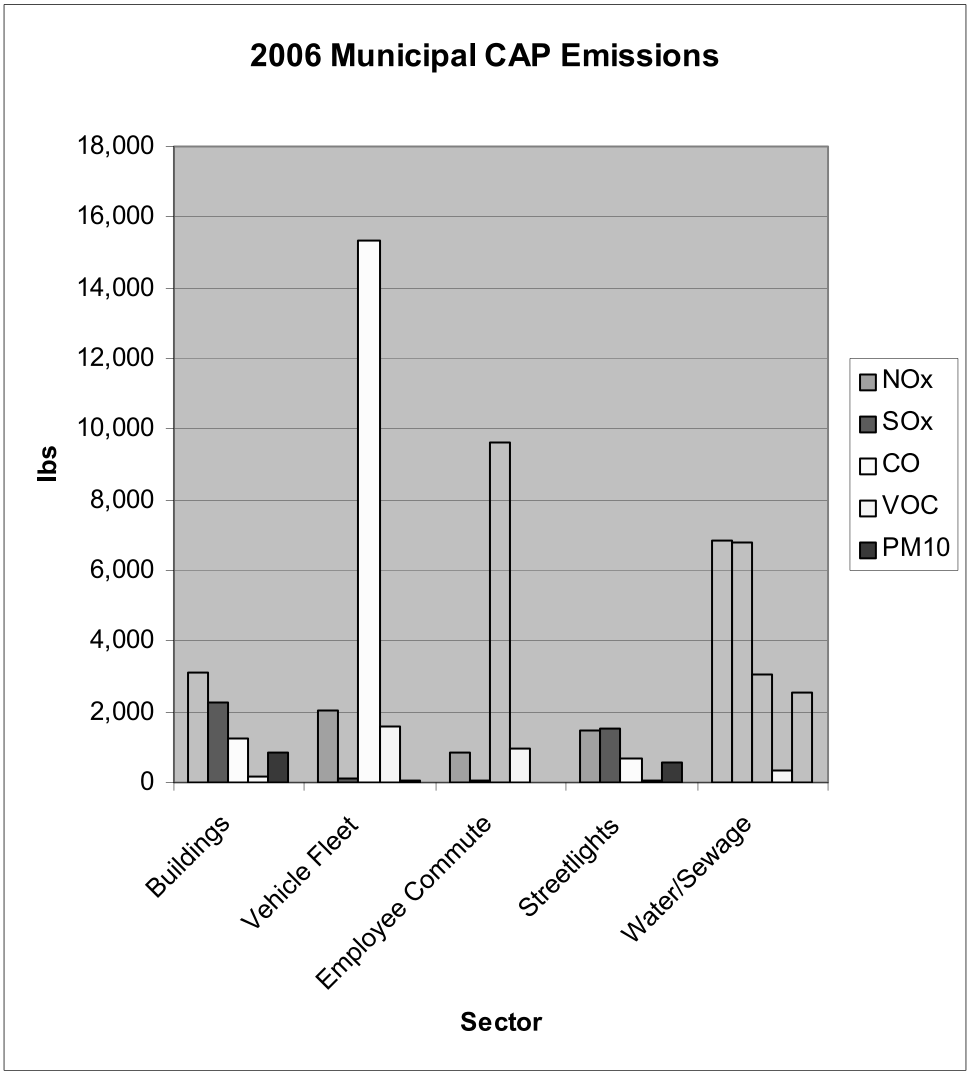


Figure 3. 2006 Municipal CAP Emissions (lbs)

The community of Lincoln City generated approximately 383,654 metric tons of CO_2e emissions in 2006. Commercial buildings accounted for the largest percentage of emissions at 40 percent. Emissions from residential energy use were second largest (30 percent) followed closely by transportation energy use (28 percent). The industrial (insignificant percentage) and solid waste (2 percent) sectors contributed significantly less emissions. Other, at an equally insignificant percentage, is being reported for methane release (CH_4) from fugitive emissions from community septic systems, along with nitrous oxide emissions (N_2O) from process emissions from wastewater treatment plant operations with nitrification/denitrification, and process emissions from effluent discharge to rivers and estuaries (Schooner Creek).

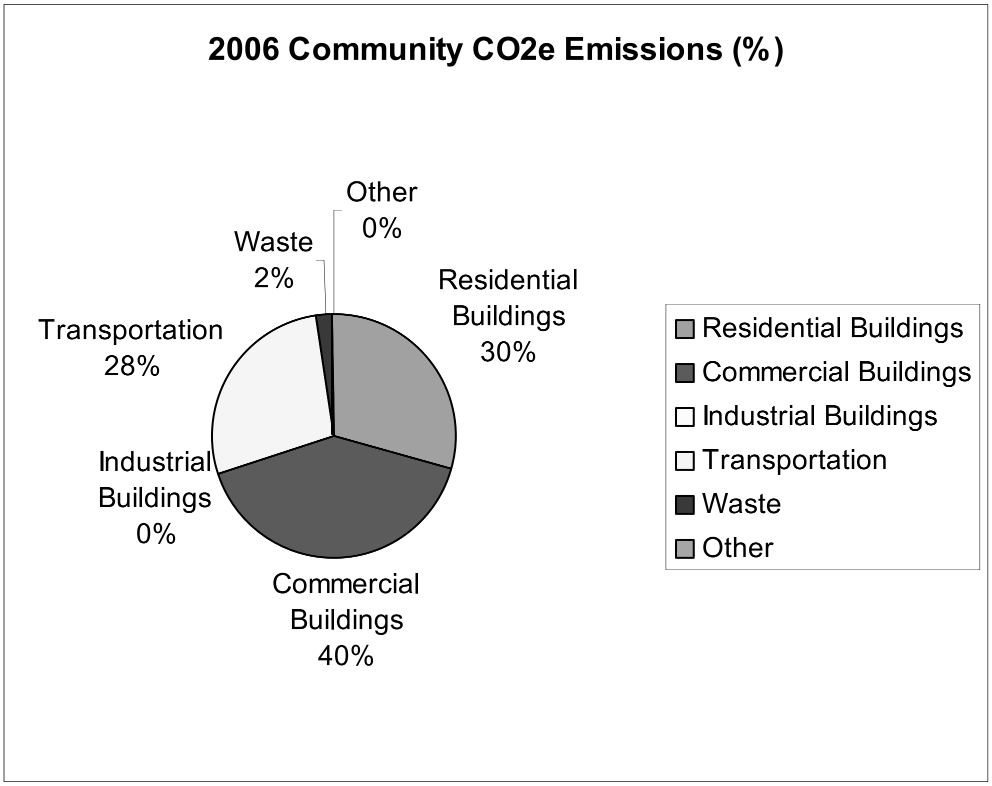


Figure 4. 2006 Community CO_2e Emissions by Sector (%)

Community Sector	MTCO2e
Residential Buildings	113,322
Commercial Buildings and Facilities	153,968
Industrial Buildings and Facilities	218
Transportation	107,678
Waste	8,304
Other	164
TOTAL	383,654

Table 2. 2006 Community CO_2e Emissions by Sector ($MTCO_2e$)

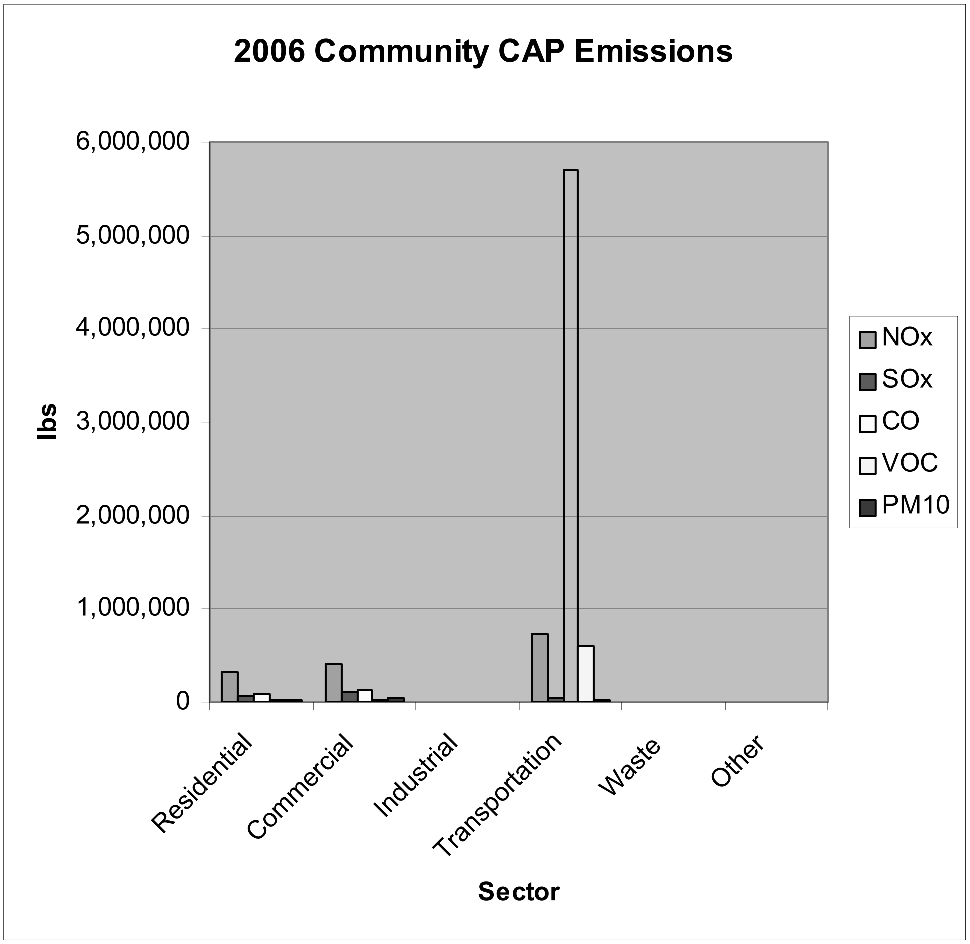


Figure 5. 2006 Community CAP Emissions (lbs)

5. CONCLUSION

ICLEI's Cities for Climate Protection Campaign is a novel and progressive program, and the attempt by Lincoln City, at this moment in history to adhere to such a program, represents a likewise and commendable pursuit. Lincoln City, Oregon is very much ahead of the game, as compared with other cities, and other local governments will be watching what Lincoln City does in the future. Hopefully, with Lincoln City blazing the way, as a model for possibility and feasibility, they will all soon follow suit.

This Greenhouse Gas Inventory represents only the first step (Milestone 1) towards the 5 milestone strategy for CO_2e reductions for the reversal of global warming, as outlined above. The next 4 milestones will need to be addressed from here forward in order to respond effectively and locally to the imminent and foreseeable impacts of global warming. An aggressive target should be set for reducing locally generated greenhouse gas emissions within a specific, and near term time frame (Milestone 2). Specific strategies and measures can then be formulated and identified to meet this target using software-based decision support tools such as ICLEI's Climate and Air Pollution Planning Assistant (CAPPA) Tool for the development of a Local Climate Action Plan (Milestone 3). The ensuing formulation and adoption of city policies and mandates by city officials supporting the Local Climate Action Plan and the reduction measures outlined within, can then be accomplished (Milestone 4). A monitoring and verification program should then be developed to measure progress toward the CO_2e emissions reduction goals (Milestone 5).

Adoption of a Local Climate Action Plan has other benefits as well, as it will not only reduce greenhouse gas emissions, but will also help local residents, businesses, and governments reduce their energy costs and help identify and/or develop mitigation sources for carbon sequestration. This will, in turn, help clean the local airshed and thus help reduce incidences of asthma, other airborne illnesses, cancer, and lung diseases. This will also help reduce the current economic dependence on imported fossil fuels, and energy production from non-renewable energy sources.

If the grand cumulative total of CO_2e emissions reduction efforts for global sustainability, as accomplished through each of our local efforts, where possible and feasible, can have an overall positive and reversing effect on global warming, we will have benefited the planet as a whole, the only planet we currently have. We, as the world's most powerful and influential leader, need to take a leadership role in this effort. Then, and only then, can we expect other less-fortunate nations to follow suit. Local governments within the United States of America are in the prime position to lead this effort for cumulative effect.

NOW is the time to deal with global warming, as we will not have another opportunity to do so! With the CO_2e ppm level currently at 388 ppm, we are dangerously approaching the widely held, overwhelmingly unanimous scientific consensus, tipping point of 450 ppm[2]. At the current level of human activity and projected growth trends, we will reach 450 ppm by the year 2035[2]. Carbon emissions with their associated GWPs have long lead times measured in centuries. We will continue to witness and deal with the ever increasing climate change effects leading up to this point. It is at this point that scientists warn that these effects will become irreversible and may trigger enormous unforeseen consequences not yet envisioned or imagined. By then any attempt by man to undo what has been done will be futile. Due to the vastness of scope, advances in technology cannot, and should not, be relied upon as a "golden parachute". Coupled with the long lead times required for city planning and administration, budget allocation, funding cycles, etc., urgency, attentiveness and effective decision making is required NOW for guaranteed survival, along with the promise for socio-economic security, environmental stability, and well-being for our future and the future of all life on this planet.

2. "*Nation Under Seige: Sea Level Rise on Our Doorstep*", 2030 Inc. | Architecture2030, Sept. 2007

APPENDIX A: DETAILED METHODOLOGIES

The following narrative for detailed methodologies was largely taken from the 2007 Greenhouse Gas Inventory of Springfield, Oregon. Although some of the methodologies listed below can be performed manually, as was the case for Springfield, the ICLEI CACP Software Tool performs these steps automatically. All that is required to reach the CO_2e and CAP emissions estimates are the proper input of data, along with their constituent units.

A. ENERGY USE

Emissions from energy usage are based on annual consumption and are disaggregated into residential, commercial and industrial sectors, which are further broken down by fuel source. Potential sources of energy in a community include:

Electricity
Natural gas
Propane
Coal
Fuel oil
Steam
Residential heating oil
Wood

The energy study included electricity and natural gas sources only, as the usage of other fuels and generation methods were either too hard to obtain, or not significantly used in Lincoln City.

Electricity

Electricity comes from some other form of energy – oil, natural gas, moving water, wind, geothermal steam, nuclear, etc. Electricity from fossil fuels emits significantly more greenhouse gas than electricity from renewable resources (e.g., hydropower, wind, solar, and biomass).

Each power plant has its own greenhouse gas emissions coefficient that is based on the type of fuel burned and the plant's thermal efficiency. Thermal efficiency is a function of the power plant's design, and indicates how much of the heat created during combustion becomes electricity.

Often, a community receives power from many locations and energy sources. The mix can vary from one hour to the next. The most accurate method (bottom-up approach) to determine the emissions coefficient for electricity use for a community is to identify the exact sources, coefficients, and mix for the electricity. The local utility may have already calculated this coefficient. If not, an alternative method (top-down approach) is to use the emissions coefficient calculated annually for each state by the U.S. Department of Energy based on the average amount of power supplied from various sources.

Emissions from electric power are “assigned” to the electricity’s end-user, rather than the power generation facility itself. Accounting for these “indirect” emissions makes it possible to demonstrate how electricity-consuming activities occurring within the target area are directly responsible for GHG emissions, regardless of whether the physical emissions occur in the area or not. Making the connection between electricity-consuming activities and the resulting (off-site) emissions is an important step in emissions management.

Sources of info:

Local utility companies

B. TRANSPORTATION

Emissions from the transportation sector are generally broken down by fuel source and typically limited to gasoline and diesel fuel (although some communities also document emissions from biodiesel, propane and other less prevalent fuel sources). Air travel is not generally part of GHG emissions inventory protocol, despite being a major contributor to greenhouse gas emissions.

Steps for calculating emissions from transportation (top-down approach):

The ICLEI Model provides a top-down approach that includes built-in assumptions about Vehicle Miles Traveled (VMT), including the number of vehicle trips, the length of the trips, and the number of people in each vehicle. The CACP V1.1 software provides a tool within the Community Transportation Analysis module called the Transport Assistant to perform such a top-down analysis which will calculate VMT given Average Annual Daily Traffic (AADT) counts across several road types. (See Appendix B.) Default values are used for vehicle fuel efficiency and greenhouse gas emissions per unit of fuel based on number of people per vehicle, trip length, fuel consumption, and CO_2 emissions per unit of fuel.

Steps for calculating emissions from transportation (bottom-up approach):

1. Find the total annual VMT of different vehicle types within the geographic area from the local transportation planning or traffic management department. It may be easiest to use daily VMT. Many inventories use a multiplication factor (e.g., 330) to account for travel volume decreases on weekends and holidays. *However, due to the high tourist-dependant economy in Lincoln City, driving actually increases on the weekend, so daily VMT is multiplied by a factor of 365.*

2. Using state averages, or that recommended by ICLEI, break down VMT figures by vehicle type and size class.

3. Calculate the number of gallons of fuel used given average fuel efficiency of each type of vehicle. State averages include gasoline and diesel but not alternatives such as biodiesel. It is assumed that such alternatives represent an insignificant amount of overall transportation fuel. Note: State averages for fuel efficiency may not accurately reflect average fuel efficiency for local vehicles.

4. Convert estimated gallons of gasoline and diesel combusted by vehicles into GHG emissions.

The efforts to obtain actual vehicle data for all vehicles owned and operated within the city limits for 2006 through the Oregon Department of Motor Vehicles (DMV) was obtained. This presented a “workable” snap-shot for the resident- and commercially-owned and operated vehicle types and fuels that existed within city limits. However, in order to provide a truer and more comprehensive snap-shot for Lincoln City, one would also have to include data for the significant tourist-based contribution (vehicles originating out-of-town), which was (and still is) largely unknown and unquantifiable. The amount of effort, programs, community and tourist support, etc. needed to produce such a study to assess tourist-based emissions would be quite phenomenal, and is deemed too costly to attempt with little gain at this point in the science of GHG inventories. Other U.S. cities with high tourist-based activities and economies currently performing GHG inventories are encountering the same problems and reaching the same conclusions.

Also, there is no accurate way to assess other potentially significant emissions for such things as: the amount of industrial and farm vehicle usage, stationary emissions from truck mounted propane equipment and diesel generators (pneumatic pumps, water and chemical pumps, electric generators, etc.), logging vehicle activities, federal, state and county-owned vehicle usage within city limits, etc. This made adopting a bottom-up approach a near impossibility. Because of this data insufficiency, using the default vehicle mix and fuel types provided within CACP for “typical” vehicular transportation in a “typical” U.S. city would be much more cost effective, at this time, than what a more lengthy and costly bottom-up approach methodology could provide.

It was therefore held that the top-down approach to this study represented the best the city could perform with what data was readily available for 2006 and the resources (time and money) allocated to perform the inventory. ICLEI’s CACP software version 1.1 is not yet a fully robust tool, but represents a good “first step” in an emerging science which does provide a reasonable level of analysis to be useful enough for the development of GHG reduction measures and strategies. It continues to evolve with the newer version due out soon in the 1st quarter of 2009, which was not available at the time of this study.

Sources of info:

Local City or County

State Department of Transportation

Federal Highway Administration, Highway Statistics:
http://www.fhwa.dot.gov/policy/ohpi/hss/index.htm

C. SOLID WASTE

Greenhouse gas inventories generally count only GHG emissions from waste disposed in landfills; emissions released when the materials were manufactured are not included. Landfilling can result in a positive or negative contribution to an area's GHG emissions, depending on the type of waste and on the management of the waste in the landfill. For example, when carbonaceous material such as paper is buried in a landfill, part of its carbon is sequestered. This means it can no longer enter the atmosphere as greenhouse gas. The remainder of the carbon decomposes to methane, a potent greenhouse gas, and carbon dioxide.

Categories of waste for GHG Inventories:

Estimate of composition (percentage of different types of waste):

1. Paper and paper products
2. Food waste
3. Plant debris
4. Wood, furniture, textiles
5. All other waste

When methane is allowed to escape to the atmosphere, net GHG emissions from solid waste is substantial. However, sometimes methane is captured and used to generate electricity. The net effect of landfilling solid waste when using this accounting method is to reduce a community's overall GHG emissions. However, the amount of GHG sequestered when waste is landfilled offsets only a fraction of the amount of GHG produced when those same materials were manufactured. For instance, manufacturing a ton of office paper generates 3 tons of GHG. Landfilling that ton of office paper will only offset about 0.5 tons of the emissions from manufacture, depending on the landfill operation. To prevent double counting, manufacturing emissions are not part of a community's GHG inventory; instead they accrue to the manufacturer.

The following categories of solid waste are used by the CACP software, and therefore by jurisdictions using the CACP methodology: Paper Products, Food, Plant Debris, Wood/Textiles, and All Other Waste.

Steps to Calculate Emissions from Solid Waste:

1. Determine how much waste is disposed in landfills in the target year by residential and commercial sectors. Do not count recycled materials.

2. Estimate, by percentages, the composition of waste (e.g., paper, food, etc.)

3. Determine if any methane is captured from landfills.

4. Convert solid waste tonnage into GHG emissions using standard coefficients (e.g., used by CACP software).

Data Sources:

Local waste haulers

Local landfill

Local waste management agencies

Statewide waste management agencies

APPENDIX B: DATA AND CALCULATIONS

1. GOVERNMENT ANALYSIS

A. ENERGY

For municipal analysis, emissions from energy use are captured mainly from Buildings and Facilities. Energy emissions accounted for in this inventory include electricity and natural gas sources; other sources of emissions from energy use such as propane, fuel oil and wood are not included. The ICLEI supplied NERC Region 11 coefficients where used to determine all CO_2e and CAP emissions totals.

Electricity

The only electric utility serving the City of Lincoln City municipality is Pacific Power. The energy purchased by the city in 2006 did not comprise any contracted purchase agreements with Pacific Power for renewable energy sources of any kind. The following table lists all of the buildings and facility's electric power usage owned and operated by the municipality, by building/facility. (Data Source: Doris Johnston, Renewable Energy Analyst, Pacific Power; Phone: 541-744-3772, email: doris.Johnston@pacificorp.com)

BUILDING/FACILITY KWH Usage for Lincoln City SNAPSHOT FROM PACIFIC POWER BILL (BILLING DATE DEC 28, 2006 ACCT. NO. 11546921-001) (KWH FURNISHED BY PACIFIC POWER - Doris Johnson)	
Description	Total KWH/yr
POLICE 1503 East Devils Lake Rd. Meter #2146016	150880
LCCC POOL/Multi-purpose Building Meter #82699002	495000
RESTROOM Kirtsis Field Meter #29348815	1958
RESTROOM 17th St. Meter #90280462	12908
RESTROOM 50th St. Meter #90280461	10745
Dr. Fredrich Clinic Meter #38980662	0
NW 14th St. Meter #70610370	355
RESTROOM at Boat Ramp Meter #92343260	1093
CITY SHOP 1655 East Devils Lake Rd. Meter #28230133	98360
RESTROOM 5200 SW Hwy 101 Meter #15513539	2191
RESTROOM 2250 NE Quay Ave. Meter #80828476	1359
RESTROOM SW 65th & Ebb Meter #18141606	2472
RESTROOM 15th St. Ramp Meter #80899968	4849
RESTROOM SW 51st St. Meter #23274601	7031

RESTROOM 2760 NW Neptune Meter #82549859	1957
LCCC POOL/Multi-purpose Building (Construction) Schedule 23	0
LCCC POOL/Multi-purpose Building (Construction) Meter #23745536	127280
4821 SW Hwy 101 GLASS BLOWER BLDG. Schedule 102	0
CITY HALL 801 SW Hwy 101 Meter #23763447	747840
RADIO TOWER REPEATER 1638 NE Oar Ave. Meter #28396325	3405
PEDESTRIAN PICNIC SHELTER 800 Block SE 51st Meter #82952059	1
GRAND TOTAL KWH/YR	1669684

Table 3. 2006 Municipal Electricity Usage (kwh)

Natural Gas

The only natural gas utility serving the City of Lincoln City municipality is NW Natural Gas. The following table lists all of the buildings and facility's natural gas usage owned and operated by the municipality, by building/facility. (Data Source: Customer Service, NW Natural Gas; Phone: 800-422-4012.

NATURAL GAS (THERMS) Usage for Lincoln City SNAPSHOT FROM NW NATURAL GAS BILLS 2006) (THERMS FURNISHED BY NW NATURAL GAS)	
Description	Total THERMS/yr
Lincoln Square #A	6,642
Lincoln Square #B	2,439
Lincoln Square #C	0
LCCC Pool	37,558
LCCC Gym	2,901
Regatta Grounds	93
City Shop 1655 EDLR	877
NE 21st & WDLR	6
1995 SE 15th	272
3939 NW Jetty Ave.	246
Police, 1505 EDLR	1,144
540 NE Hwy 101	7,016
GRAND TOTAL THERMS/YR	**59,194**

Table 4. 2006 Municipal Natural Gas Usage (therms)

B. VEHICLE FLEET

VEHICLE FLEET Fossil Fuel Usage for City of Lincoln City Municipal Vehicles & Stationary Equipment (2006 Snapshot from Willis Degenstein - Fleet Vehicle Maintenance Manager)								
DEPT.	VEHICLE DATA						VMT /yr	FUEL HOURS (metered runtime)
	VEH ID	Year	Make	Model	Vehicle Type	Fuel Type		
BLDG MAINT	100	1985	Komatsu	FG20	FORKLIFT	PROPANE		30 lbs.
BLDG MAINT	103	1995	Ford	Aerostar	VANPOOL	UNL GASOLINE	751	
BLDG MAINT	111	2001	Chevy	Venture	VANPOOL	UNL GASOLINE	2845	
BLDG MAINT	115	1996	Chevy	Astro Van	VANPOOL	UNL GASOLINE	3193	
PARKS	101	2000	Ford	Ranger	LIGHT TRUCK/PICKUP - SMALL	UNL GASOLINE	2525	
PARKS	102	1994	Ford	F250	LIGHT TRUCK/PICKUP - LARGE	UNL GASOLINE	3000	
PARKS	104	1995	Chevy	C3500	HEAVY TRUCK - SMALL	UNL GASOLINE	3172	
PARKS	108	1999	Chevy	C2500	LIGHT TRUCK/PICKUP - LARGE	UNL GASOLINE	2700	
PARKS	114	2001	Dodge	Dakota	LIGHT TRUCK/PICKUP - MED SML	UNL GASOLINE	3019	
PARKS	116	2002	Chevy	C2500	LIGHT TRUCK/PICKUP - LARGE	UNL GASOLINE	11792	
PARKS	117	2005	Ford	F250	LIGHT TRUCK/PICKUP - LARGE	UNL GASOLINE	3190	
PARKS	119	2006	Ford	F350	LIGHT TRUCK/PICKUP - LARGE	UNL GASOLINE	500	
PARKS	121	2003	Kubota	B7800	TRACTOR	DIESEL		221
PARKS	124	?	Kubota	YM155D	TRACTOR	DIESEL		0
PARKS	127	2003	John Deer	GX335	LAWN MOWER	DIESEL		222
POLICE	501	1999	Chevy	Lumina	AUTO - MID-SIZE	UNL GASOLINE	2826	
POLICE	502	1991	Chevy	Tahoe	LIGHT TRUCK/SUV - MED LG	UNL GASOLINE	5262	
POLICE	504	1999	Chevy	Tahoe	LIGHT TRUCK/SUV - MED LG	UNL GASOLINE	2756	
POLICE	505	1999	Chevy	Lumina	AUTO - MID-SIZE	UNL GASOLINE	7077	
POLICE	511	1990	Ford	Bronco	LIGHT TRUCK/SUV - MED LG	UNL GASOLINE	1036	
POLICE	512	1999	Chevy	Tahoe	LIGHT TRUCK/SUV - MED LG	UNL GASOLINE	6000	
POLICE	513	2001	Chevy	Impala	AUTO - MID-SIZE	UNL GASOLINE	6850	
POLICE	515	1998	Chevy	Lumina	AUTO - MID-SIZE	UNL GASOLINE	3386	
POLICE	516	2001	Chevy	Impala	AUTO - MID-SIZE	UNL GASOLINE	6850	
POLICE	517	2003	Ford	Crown Victoria	AUTO - FULL-SIZE	UNL GASOLINE	5867	
POLICE	518	2003	Ford	Crown Victoria	AUTO - FULL-SIZE	UNL GASOLINE	13033	
POLICE	519	2003	Ford	Crown Victoria	AUTO - FULL-SIZE	UNL GASOLINE	13558	
POLICE	520	2003	Ford	Crown	AUTO - FULL-SIZE	UNL GASOLINE	13000	

				Victoria				
POLICE	521	2004	Ford	Crown Victoria	AUTO - FULL-SIZE	UNL GASOLINE	13000	
POLICE	522	2004	Ford	Crown Victoria	AUTO - FULL-SIZE	UNL GASOLINE	13289	
POLICE	523	2005	Ford	Crown Victoria	AUTO - FULL-SIZE	UNL GASOLINE	36503	
PUBLIC WORKS	228	1995	Jeep	Cherokee	LIGHT TRUCK/SUV - MED SML	UNL GASOLINE	2000	
PUBLIC WORKS	401	1994	Ford	F250	LIGHT TRUCK/PICKUP - LARGE	UNL GASOLINE	2652	
STREETS	201	1996	Chevy	C3500	HEAVY TRUCK - SMALL	UNL GASOLINE	8990	
STREETS	202	1991	Case	580K	BACKHOE	DIESEL		256
STREETS	203	1997	Chevy	Lumina	AUTO - MID-SIZE	UNL GASOLINE	6254	
STREETS	204	1997	Chevy	Astro Van	VANPOOL	UNL GASOLINE	2767	
STREETS	205	1997	GMC	Topkick	DUMP TRUCK	DIESEL	2284	
STREETS	206	1997	Wacker	RD880	LAWN EQUIPMENT	UNL GASOLINE		10
STREETS	207	1998	Chevy	C3500	HEAVY TRUCK - SMALL	UNL GASOLINE	8876	
STREETS	208	2006	John Deer	6320	TRACTOR	DIESEL		201
STREETS	210	1999	Chevy	C2500	LIGHT TRUCK/PICKUP - LARGE	UNL GASOLINE	11831	
STREETS	212	1990	Brush Bandit	200	LAWN EQUIPMENT	DIESEL		13
PUBLIC WORKS	213	2000	Dodge	Durango	LIGHT TRUCK/PICKUP - MED SML	UNL GASOLINE	2444	
STREETS	234	1990	International	4200	HEAVY TRUCK - MED	DIESEL	1500	
STREETS	260	1989	John Deer	570B	TRACTOR	DIESEL		75
WASTE WATER	402	1997	Chevy	C3500	HEAVY TRUCK - SMALL	UNL GASOLINE	4335	
WASTE WATER	403	1997	Chevy	S-10	LIGHT TRUCK/PICKUP - SMALL	UNL GASOLINE	6933	
WASTE WATER	404	2000	Chevy	C2500	LIGHT TRUCK/PICKUP - LARGE	UNL GASOLINE	9981	
WASTE WATER	405	2005	Ford	F350	LIGHT TRUCK/PICKUP - LARGE	UNL GASOLINE	9991	
WASTE WATER	406	2006	Ford	F350	LIGHT TRUCK/PICKUP - LARGE	UNL GASOLINE	3265	
WASTE WATER	436	2003	John Deer	310SG	BACKHOE	DIESEL		50
WASTE WATER	446	?	Yanmar	YM155D	TRACTOR	DIESEL		11
WATER	301	1993	Case	580SK	BACKHOE	DIESEL		35
WATER	302	1995	Chevy	S-10	LIGHT TRUCK/PICKUP - SMALL	UNL GASOLINE	3052	
WATER	304	2004	Ford	Ranger	LIGHT TRUCK/PICKUP - SMALL	UNL GASOLINE	18439	
WATER	303	1995	Chevy	S-10	LIGHT TRUCK/PICKUP - SMALL	UNL GASOLINE	2359	
WATER	305	1996	Chevy	C3500	HEAVY TRUCK - SMALL	UNL GASOLINE	10000	
WATER	307	1999	Chevy	S-10	LIGHT TRUCK/PICKUP - SMALL	UNL GASOLINE	7500	
WATER	309	2000	Chevy	C2500	LIGHT TRUCK/PICKUP - LARGE	UNL GASOLINE	5380	
*WATER	310	2003	John Deer	310SG	BACKHOE	DIESEL		295

*WATER	311	2005	International	4400	DUMP TRUCK	DIESEL	13658	
WATER	312	2005	Ford	F450	HEAVY TRUCK - SMALL	UNL GASOLINE	9021	
WATER	314	2006	Ford	F450	HEAVY TRUCK - SMALL	UNL GASOLINE	3000	
WATER	336	1991	John Deer	316	TRACTOR	DIESEL		125
WATER	361	1992	Dodge	W250	LIGHT TRUCK/PICKUP - LARGE	UNL GASOLINE	2531	
WATER PLANT	308	2006	Ford	Ranger	LIGHT TRUCK/PICKUP - SMALL	UNL GASOLINE	12083	
						GRAND TOTAL	**358106**	**1514**

Table 5. 2006 Municipal Vehicle Fleet Fuel Usage (Miles/Metered Hours)

C. EMPLOYEE COMMUTE

2006 EMPLOYEE COMMUTE
Fossil Fuel Usage for City of Lincoln City Employee Vehicles
(As taken from the Employee Commute Survey)
NOTE: Commuting days/week could be different for each employee, and was taken into account on the survey.

DEPT.	VEHICLE DATA		Miles 1-Way to Work	VMT /yr (1)
	Vehicle Type	Fuel Type		
PW	AUTO COMPACT	UNL GASOLINE	1.5	780
PW	LIGHT TRUCK/SUV/PICKUP	UNL GASOLINE	15	7,800
PW	LIGHT TRUCK/SUV/PICKUP	ETHANOL	1	520
PW	AUTO SUB-COMPACT	UNL GASOLINE	0.5	260
PW	LIGHT TRUCK/SUV/PICKUP	UNL GASOLINE	0	0
PW	LIGHT TRUCK/SUV/PICKUP	UNL GASOLINE	7	3,640
PW	LIGHT TRUCK/SUV/PICKUP	UNL GASOLINE	3	1,560
PW	LIGHT TRUCK/SUV/PICKUP	UNL GASOLINE	7.5	3,900
PW	AUTO SUB-COMPACT	UNL GASOLINE	7	3,640
PW	AUTO COMPACT	UNL GASOLINE	3	1,560
PW	AUTO MID-SIZE	UNL GASOLINE	0	0
PW	AUTO MID-SIZE	UNL GASOLINE	15	7,800
PW	LIGHT TRUCK/SUV/PICKUP	UNL GASOLINE	7	3,640
PW	AUTO SUB-COMPACT	UNL GASOLINE	0.5	260
PW	LIGHT TRUCK/SUV/PICKUP	UNL GASOLINE	0.5	260
PW	AUTO FULL-SIZE	UNL GASOLINE	1.75	910
PW	LIGHT TRUCK/SUV/PICKUP	UNL GASOLINE	11	5,720
PW	LIGHT TRUCK/SUV/PICKUP	UNL GASOLINE	22	11,440
PW	LIGHT TRUCK/SUV/PICKUP	UNL GASOLINE	0	0
PW	LIGHT TRUCK/SUV/PICKUP	UNL GASOLINE	11	5,720

PW	LIGHT TRUCK/SUV/PICKUP	UNL GASOLINE	0.25	130
PW	AUTO COMPACT	UNL GASOLINE	0.5	260
PW	AUTO SUB-COMPACT	UNL GASOLINE	1	520
PW	VAN	UNL GASOLINE	0.5	260
PW	LIGHT TRUCK/SUV/PICKUP	UNL GASOLINE	11	5,720
PW	LIGHT TRUCK/SUV/PICKUP	UNL GASOLINE	0.5	260
PW	AUTO MID-SIZE	UNL GASOLINE	11	5,720
PW	LIGHT TRUCK/SUV/PICKUP	UNL GASOLINE	4.5	2,340
PW	AUTO SUB-COMPACT	UNL GASOLINE	0.5	156
PW	LIGHT TRUCK/SUV/PICKUP	UNL GASOLINE	1.5	780
PW	AUTO COMPACT	UNL GASOLINE	7	3,640
PW	AUTO COMPACT	UNL GASOLINE	5	2,600
PW	AUTO COMPACT	UNL GASOLINE	5	2,600
URBAN RENEWAL	AUTO COMPACT	UNL GASOLINE	0.5	260
URBAN RENEWAL	LIGHT TRUCK/SUV/PICKUP	UNL GASOLINE	4.6	2,392
VCB	LIGHT TRUCK/SUV/PICKUP	UNL GASOLINE	11	5,720
VCB	LIGHT TRUCK/SUV/PICKUP	UNL GASOLINE	0	0
ADMIN	LIGHT TRUCK/SUV/PICKUP	UNL GASOLINE	3	1,560
VCB	LIGHT TRUCK/SUV/PICKUP	UNL GASOLINE	2	832
ADMIN	AUTO COMPACT	UNL GASOLINE	2	1,040
ADMIN	LIGHT TRUCK/SUV/PICKUP	UNL GASOLINE	0	0
FINANCE	AUTO MID-SIZE	UNL GASOLINE	1.5	780
PLANNING	LIGHT TRUCK/SUV/PICKUP	UNL GASOLINE	4	2,080
PLANNING	AUTO MID-SIZE	UNL GASOLINE	1.5	780
PLANNING	AUTO COMPACT	UNL GASOLINE	0.5	260
POLICE	LIGHT TRUCK/SUV/PICKUP	UNL GASOLINE	5	2,080
POLICE	LIGHT TRUCK/SUV/PICKUP	UNL GASOLINE	0	0
POLICE	LIGHT TRUCK/SUV/PICKUP	UNL GASOLINE	3.5	1,260
POLICE	LIGHT TRUCK/SUV/PICKUP	UNL GASOLINE	0	0
POLICE	LIGHT TRUCK/SUV/PICKUP	UNL GASOLINE	0	0
POLICE	RIDESHARE	UNL GASOLINE	13	5,408
POLICE	AUTO MID-SIZE	UNL GASOLINE	4	2,080
POLICE	LIGHT TRUCK/SUV/PICKUP	UNL GASOLINE	0	0
POLICE	LIGHT TRUCK/SUV/PICKUP	UNL GASOLINE	57	2,3712
POLICE	AUTO FULL-SIZE	UNL GASOLINE	4	2,080
POLICE	AUTO MID-SIZE	UNL GASOLINE	0	0
POLICE	LIGHT TRUCK/SUV/PICKUP	UNL GASOLINE	47	19,552
POLICE	LIGHT TRUCK/SUV/PICKUP	UNL GASOLINE	3.6	1,498
POLICE	LIGHT TRUCK/SUV/PICKUP	UNL GASOLINE	7	3,640
POLICE	AUTO SUB-COMPACT	UNL GASOLINE	1	520
POLICE	AUTO COMPACT	UNL GASOLINE	5	2,600
POLICE	AUTO SUB-COMPACT	UNL GASOLINE	0.5	180

POLICE	AUTO FULL-SIZE	UNL GASOLINE	0	0
POLICE	AUTO MID-SIZE	UNL GASOLINE	0.5	264
POLICE	LIGHT TRUCK/SUV/PICKUP	UNL GASOLINE	0.75	396
POLICE	AUTO COMPACT	UNL GASOLINE	0	0
POLICE	AUTO FULL-SIZE	UNL GASOLINE	9.5	3,192
POLICE	HEAVY TRUCK	UNL GASOLINE	4	1,344
POLICE	AUTO COMPACT	UNL GASOLINE	26	8,736
POLICE	WALKS	HUMAN	0	0
POLICE	LIGHT TRUCK/SUV/PICKUP	UNL GASOLINE	0	0
POLICE	AUTO MID-SIZE	UNL GASOLINE	0	0
POLICE	LIGHT TRUCK/SUV/PICKUP	UNL GASOLINE	1.4	470
POLICE	LIGHT TRUCK/SUV/PICKUP	UNL GASOLINE	30	10,080
POLICE	HEAVY TRUCK	DIESEL	3	1,008
POLICE	LIGHT TRUCK/SUV/PICKUP	UNL GASOLINE	12	4,032
POLICE	AUTO MID-SIZE	UNL GASOLINE	0	0
POLICE	AUTO COMPACT	UNL GASOLINE	7	2,912
POLICE	AUTO MID-SIZE	UNL GASOLINE	0	0
POLICE	AUTO COMPACT	UNL GASOLINE	0	0
POLICE	LIGHT TRUCK/SUV/PICKUP	UNL GASOLINE	5	2,080
POLICE	AUTO COMPACT	UNL GASOLINE	25	10,400
ADMIN (HR)	AUTO COMPACT	UNL GASOLINE	0	0
PLANNING	RIDESHARE	UNL GASOLINE	0	0
PARKS	AUTO COMPACT	UNL GASOLINE	9	3,744
VCB	AUTO COMPACT	UNL GASOLINE	7	3,640
PARKS	AUTO COMPACT	UNL GASOLINE	0.25	130
PARKS	AUTO MID-SIZE	UNL GASOLINE	3	624
PARKS	AUTO MID-SIZE	UNL GASOLINE	12	6,240
PARKS	AUTO MID-SIZE	UNL GASOLINE	8	3,328
PARKS	AUTO MID-SIZE	UNL GASOLINE	24	12,480
PARKS	LIGHT TRUCK/SUV/PICKUP	UNL GASOLINE	0	0
PARKS	AUTO MID-SIZE	UNL GASOLINE	0.5	260
POLICE	AUTO MID-SIZE	UNL GASOLINE	10	4,160
PLANNING	AUTO MID-SIZE	UNL GASOLINE	0	0
LIBRARY	AUTO MID-SIZE	UNL GASOLINE	0	0
LIBRARY	AUTO COMPACT	UNL GASOLINE	2	624
LIBRARY	AUTO COMPACT	UNL GASOLINE	1	520
LIBRARY	AUTO MID-SIZE	UNL GASOLINE	0	0
LIBRARY	AUTO COMPACT	UNL GASOLINE	32.2	13,395
LIBRARY	AUTO MID-SIZE	UNL GASOLINE	0	0
LIBRARY	AUTO COMPACT	UNL GASOLINE	3	720
LIBRARY	AUTO MID-SIZE	UNL GASOLINE	5	2,600
LIBRARY	AUTO COMPACT	UNL GASOLINE	5	2,080

LIBRARY	AUTO COMPACT	UNL GASOLINE	14	5,824
LIBRARY	AUTO COMPACT	UNL GASOLINE	40	20,800
VCB	LIGHT TRUCK/SUV/PICKUP	UNL GASOLINE	0	0
LIBRARY	AUTO COMPACT	UNL GASOLINE	12.5	6,500
MUNI COURT	AUTO SUB-COMPACT	UNL GASOLINE	3.5	1,820
FINANCE	AUTO MID-SIZE	UNL GASOLINE	2	832
FINANCE	RIDESHARE	UNL GASOLINE	5	2,600
FINANCE	AUTO COMPACT	UNL GASOLINE	50	26,000
FINANCE	RIDESHARE	UNL GASOLINE	52	21,632
FINANCE	AUTO FULL-SIZE	UNL GASOLINE	12.5	6,500
FINANCE	AUTO COMPACT	UNL GASOLINE	1.5	780
FINANCE	LIGHT TRUCK/SUV/PICKUP	UNL GASOLINE	1.3	676
FINANCE	AUTO FULL-SIZE	UNL GASOLINE	1.5	780
FINANCE	AUTO MID-SIZE	UNL GASOLINE	1.5	780
FINANCE	LIGHT TRUCK/SUV/PICKUP	UNL GASOLINE	0	0
FINANCE	AUTO MID-SIZE	UNL GASOLINE	0	0
VCB	AUTO MID-SIZE	UNL GASOLINE	0	0
FINANCE	AUTO FULL-SIZE	UNL GASOLINE	2	1,040
PW	AUTO MID-SIZE	UNL GASOLINE	15	7,800
LIBRARY	WALKS	HUMAN	0	0
VCB	AUTO MID-SIZE	UNL GASOLINE	0	0
LIBRARY	AUTO MID-SIZE	UNL GASOLINE	1.5	624
ADMIN	AUTO COMPACT	UNL GASOLINE	22	9,152
PARKS	LIGHT TRUCK/SUV/PICKUP	DIESEL	9	3,744
PARKS	LIGHT TRUCK/SUV/PICKUP	UNL GASOLINE	10	4,160
PARKS	LIGHT TRUCK/SUV/PICKUP	UNL GASOLINE	12	4,992
(1) Assuming 260 commuting (work) days per year unless where specified (52 weeks/yr. * 5 days/week=260 days/yr). Multiplied by 2 because survey was only taken for distance one-way to work (to avoid confusion of survey participants and to foster accuracy).		**TOTALS**	**859**	**391,205**

Table 6. 2006 Municipal Employee Commute VMT (miles)

D. STREETLIGHTS

Metered Streetlights

METERED STREET LIGHTING KWH Usage for Lincoln City SNAPSHOT FROM PACIFIC POWER BILL (BILLING DATE **DEC 28, 2006** ACCT. NO. 11546921-001) (KWH FURNISHED BY PACIFIC POWER)	
Description	Total KWH/yr
801 SW Hwy 101 City Hall Prkg Lot Lights Meter #28282492	10,320
Kirtsis Field Lighting Meter #1325008	7,380
Lakeside Golf Sign Meter #35531912	0
Restroom Parking Lot Meter #39062191	321
Hwy 101 West of WDL Rd. Meter #32823857	3,391
Logan Rd. & Hwy 101 Meter #69720974	7,906
NW 22nd & Hwy 101 Meter #74556558	3,398
Traffic Signal Meter #44386678	3,181
Traffic Signal Meter #23274550	5,081
SW 51st & Hwy 101 Meter #23274551	7,544
Parking Lot Lights Meter #98391674	524
Parking Lot Lights Meter #1773301	13,576
Beach Access Lights Meter #18141605	1,885
4770 SE Hwy 101 Parking Lot Lights Meter #23110594	154
NW 26th Beach Access Meter #23080548	999
Street Lights Meter #26346815	14,175
Street Lights Meter #26346816	19,057
Street Lights Meter #26346828	15,895
GRAND TOTAL KWH/YR	**104,467**

Table 7. 2006 Metered Streetlights Energy Use (kwh)

Contract Streetlights

CONTRACT STREET LIGHTING KWH Usage for Lincoln City SNAPSHOT FROM PACIFIC POWER BILL (BILLING DATE **DEC 28, 2006** ACCT. NO. 11546921-001 & 11546921-098) (KWH RATINGS FURNISHED BY PACIFIC POWER)				
Description	KWH/mo each Lamp	KWH/yr each Lamp	# Lamps	Total KWH/yr
Street Light Mercury Vapor Wood Vertical OH 7000 Lumens	76	912	323	294,576
Street Light Mercury Vapor Wood Horizontal OH 7000 Lumens	76	912	108	98,496
Mercury Vapor 7000 LUMEN Area Light	76	912	1	912
Mercury Vapor 7000 LUMEN Area Light	76	912	1	912
Mercury Vapor 21000 LUMEN Area Light	172	2,064	1	2,064
Hwy 101 W of WDLR Fixed 50 kwh	50	600	1	600
Hwy 101 E of WDLR Fixed 50 kwh	50	600	1	600
WDLR Just Off Hwy 101 Fixed 50 kwh	50	600	1	600
14th & Oar St. Fixed 200 kwh	200	2,400	1	2,400
HPSV ST LIGHT 50,000 LUMEN SW 51st Taft Dock	176	2,112	1	2,112
HPSV ST LIGHT 27,500 LUMEN, PLUS O&M	115	1,380	137	189,060
Street Light Sodium Vapor Overhead Wood Poles 50000 Lumens	176	2,112	107	225,984
Street Light Sodium Vapor Overhead Wood Poles 22000 Lumens	85	1,020	19	19,380
Street Light Sodium Vapor Overhead Wood Poles 5800 Lumens	31	372	23	8,556
Street Light Sodium Vapor Overhead Wood Poles 9500 Lumens	44	528	143	7,5504
Street Light Sodium Vapor Overhead Wood Poles 9500 Lumens	44	528	11	5,808
Street Light Sodium Vapor Overhead Wood Poles 9500 Lumens	44	528	10	5,280

HPSV ST LIGHT 9,500 LUMEN, PLUS O&M	44	528	15	7,920
HPSV ST LIGHT 9,500 LUMEN, PLUS O&M	44	528	8	4,224
HPSV ST LIGHT 9,500 LUMEN, PLUS O&M	44	528	10	5,280
STREET LIGHT SODIUM VAPOR OVERHEAD METAL POLES 9500 LUMENS	44	528	108	57,024
Street Light Sodium Vapor Overhead Wood Poles 22000 Lumens	85	1,020	1	1020
STREET LIGHT SODIUM VAPOR OVERHEAD METAL POLES 9500 LUMENS	44	528	5	2,640
HPSV Area Lights 22,000 LUMEN	85	1,020	2	2,040

Table 8. 2006 Contract Streetlights Energy Use (kwh)

E. WATER/SEWAGE

The CO_2e emissions associated with water and sewage treatment comes largely from the buildings and facilities which perform these functions, and which house pumps, filters, valves, etc. and not from the environmental/operational load to provide comfort for employees. Due to the lack of sub-metering at these facilities and buildings which could serve to separate, and therefore more accurately quantify, the energy usages associated with those for treatment from those associated with environmental occupant and utility loads in buildings, the study reports only the sum of these two processes under the water/sewage sector.

WATER & SEWER KWH Usage for Lincoln City SNAPSHOT FROM PACIFIC POWER BILL (BILLING DATE **DEC 28, 2006** ACCT. NO. 11546921-001) (KWH FURNISHED BY PACIFIC POWER)	
Description	KWH/yr
WATER Logan & Port Dr. Meter #2985409	0
WATER PUMP Roads End Meter #63905625	34,712
WATER PUMP NE 20th & Oar St. Meter #62058339	8
WATER TANK Meter #96889724	1,017
WATER PUMP NE 19th & WDLR Meter	18,947

#2492578	
SEWER LIFT PUMP SE 14th & Oar St. Meter #34844024	29,428
WATER TREATMENT PLANT 317 S. Anderson Creek Rd. Meter #21371775	1,214,400
SEWER PUMP WDLR & Hwy 101 Meter #86200498	36,840
SEWER PUMP Lincoln Palisades Meter #70114727	513
SEWER PUMP NE 64th & Logan Rd. Otis Meter #60485482	56,314
SEWER PUMP End of 50th & Keel Otis Meter #3764274	28,031
SEWER LIFT STATION NW 31st & Jetty Meter #2378145	19,5100
SEWER PUMP Holmes & Yacht Meter #82872722	59,675
SEWER PUMP NE 29th Ct. Meter #86202220	37,002
STORM PUMP 1250 NW 16th St. Meter #86963543	5
SEWER PUMP REGATTA GROUNDS Meter #82817698	23,226
SEWER PUMP NW 40th by Shilo Meter #1508784	25,947
SEWER Maryland Dr. Meter #49416150	11,222
SEWER Spruce Woods Meter #70114744	5,295
SEWER PUMP Indian Shores Meter #47745462	4,245
SEWER PUMP SE 3rd & Inlet Meter #3554696	424,800
SEWER PUMP 1125 SW Coast Meter #55371909	10,250
SEWER PUMP SW Anchor 2500 Blk Meter #39062018	7,754
SEWER Spyglass Ridge Meter #85705576	4,712
SEWER PUMP SW Anchor Ct. & 38th Meter #47585047	18,240
SEWER PUMP SW Anchor Ct. & 37th Meter #49207733	12,361
SEWER PUMP SW 48th & Beach Meter #89661530	3,927
STORM PUMP SW 50th & Ebb Meter #2240140	26,925
SEWER SVCS Meter #21222183 (WATER TREATMENT PLANT)	2,285,800
PUMP STATION SE Jetty Meter #70306823	59,040
SEWER LIFT STATION SW 62nd & Galley Meter #86143686	42,612
PUMP STATION SW Coast Meter #91758592	2,167

SEWER PUMP Johns Loop Neotsu Meter #28314953	840
SEWER LIFT STATTION Abt Voyage Ln. Meter #1164613	1,334
WATER TANK NE Port Ln. Meter #28282338	4,500
SEWER LIFT STATION SE 35th & Hwy 101 Meter #3606407	307,960
WATER PUMP NE 36th & Quay Meter #3557427	15,611
WATER TOWER SE Lee & 19th St. Meter #17706578	155
WATER TANK Lincoln Palisades Meter #28248368	9,725
SEWER PUMP NW 11th & Harbor Meter #23745453	6,478
GRAND TOTAL KWH/YR	**5,027,118**

Table 9. 2006 Municipal Water and Sewage Energy Use (kwh)

F. SOLID WASTE

For solid waste in 2006, the only local hauler in Lincoln City was North Lincoln Sanitary. All waste was hauled to the Waste Management Riverbend Landfill and Recycling Center in McMinnville, Oregon. The landfill did not have any methane recovery system in operation during 2006.

MUNICIPAL WASTE (CUBIC YDS to TONS) Usage for City of Lincoln City SNAPSHOT FROM NORTH LINCOLN SANITARY BILLS 2006 (CUBIC YDS AND DUMP FREQUENCY FOR EACH VESSEL FURNISHED BY NORTH LINCOLN SANITARY) *Data taken from 2007 level of activity and assumed not to have significantly changed from 2006 levels (de-minimus)						COMPOSITION CUBIC YDS/YR *(as taken from the major categories from the DEFAULT CACP V1.1. Waste Composition Types. Composition %'s taken from EUGENE-SPRINGFIELD Community Greenhouse Gas Inventory of Jan. 2007 with Oregon Statewide Waste Composition for 2002, p. 22)*				
Description/ Location	No. Vessels	VESSEL SIZE (CUBIC YDS)	DUMP FREQ./wk	CUBIC YDS/mo.	CUBIC YDS/yr	PAPER .2062	FOOD .1560	PLANT DEBRIS .0658	WOOD & TEXTILES .1175	ALL OTHER .4545
Lincoln Square #A	1	1.5	1	6	72	14.85	11.23	4.74	8.46	32.72
Lincoln Square #B	2	1.5	2	1	12	2.47	1.87	0.79	1.41	5.45
Lincoln Square #C	1	1	1	4	48	9.90	7.49	3.16	5.64	21.82

Parks Hwy 101 - 6 cu yard vessel, Parks & Rec collects from city parks daily and dumps here (at city shop)	1	6	see note	see note	708	145.99	110.45	46.59	83.19	321.79
Litter cans on Hwy 101	20	1	see note	see note	188.74	38.92	29.44	12.42	22.18	85.78
Dump Tickets - YARD DEBRIS	n/a	n/a	see note	see note	174.2	0.00	0.00	174.20	0.00	0.00
PARKS - City Shop	1	6.0	3	72	864	178.16	134.78	56.85	101.52	392.69
Canyon Drive Park 1-time pickup - special event	1	1.5	0	0	1.5	0.31	0.23	0.10	0.18	0.68
Veh. Maint.+City Shop+Streets	1	1	3	12	144	29.69	22.46	9.48	16.92	65.45
Water Treatment Plant	1	1.5	2	12	144	29.69	22.46	9.48	16.92	65.45
Waste Water Treatment Plant	3	1	1	12	144	29.69	22.46	9.48	16.92	65.45
Waste Water Treatment Plant	7	1.5	1	42	504	103.92	78.62	33.16	59.22	229.07
Community Center	1	1.5	2	12	144	29.69	22.46	9.48	16.92	65.45
Police Dept.	1	1	2	8	96	19.80	14.98	6.32	11.28	43.63
					TOTAL CUBIC YDS	633.08	478.96	376.22	360.75	1395.42
** These totals were figured using estimates from Gary Newman of Parks & Recreation (via Ron Ploger) and reflect seasonal averages (468 cu yds summer months + 240 cu yds winter months = 708 cu yds total/year)*					X DENSITY FACTOR TON/CU YD	0.5	0.35	0.475	0.125	0.3
*** 21840 gals summer + 10920 gals winter = 32760 gals/yr (conversion factor: 35 gallon can (dry) = 0.201647 cu yds http://www.metric-conversions.org/volume/us-dry-gallons-to-cubic-yards.htm 32760/35=936 cans*0.201647=188.74 cu yds*					TONS	316.54	167.64	178.71	45.09	418.63
**** 2007-2008 41 trips x avg. 4.248 cu yds/trip = 174.2 cu yds/yr*										

WASTE COMPOSITION BREAKDOWN: **ACCORDING TO DEQ (2005 Survey):** 20.62% Paper Products 15.60% Food Waste 6.58% Plant Debris 11.75% Wood & Textiles 45.45% Other =100% **DENSITY FACTORS (as advised by Oregon DEQ except where stated):** 0.5 ton/cu yd Paper Products 0.35 ton/cu yd Food Waste 0.475 ton/cu yd Plant Debris (assume grass clippings @ 950 lbs./cu yd) 0.125 ton/cu yd Wood & Textiles (assume wood @ 250 lbs./cu yd) 0.30 ton/cu yd Other (assume commercial uncompacted waste @ 600 lbs./cu yd as advised by ICLEI)					**GRAND TOTAL TONS**	**1126.60**

Table 10. 2006 Municipal Solid Waste (US tons)

2. COMMUNITY ANALYSIS

A. ENERGY

Residential, Commercial and Industrial Electricity

COMMUNITY BUILDING/FACILITY KWH Usage for Lincoln City SNAPSHOT FROM PACIFIC POWER 2006 (data furnished by PACIFIC POWER - Doris Johnston email: doris.johnston@pacificorp.com)			
SECTOR	Total KWH/yr	Total Non-Renewable KWH/yr	Total Renewable KWH/yr
RESIDENTIAL	43,310,504	41,678,494	1,632,010
COMMERCIAL	66,087,404	65,855,911	231,493
INDUSTRIAL	400,106	400,106	0
*PUBLIC & HWY LIGHTS	1,104,952	1,104,952	0
TOTALS	**110,902,966**	**109,039,463**	**1,863,503**
*Adding street lights to kwh because of significance.			

Table 11. 2006 Community Electricity Usage (kwh)

Residential, Commercial and Industrial Natural Gas

COMMUNITY NATURAL GAS (THERMS) Usage for Lincoln City SNAPSHOT FROM NW NATURAL GAS 2006 (THERMS FURNISHED BY NW NATURAL GAS contact: Brian Harney @ NW Natural 503.392.4809, email: brian.harney@nwnatural.com)	
SECTOR	Total therms/yr
RESIDENTIAL	1,437,025
*COMMERCIAL	1,872,524
*INDUSTRIAL	0
GRAND TOTAL	**3,309,549**
*Commercial and Industrial values are combined because of privacy reasons per NW Natural Gas. Industrial usage alone is de-minimus.	
** Data set is for ZIP CODE = 97367 ONLY which lays outside of city limits. Does not include Neotsu 97364 addresses that partially lay within city limits, and is considered de-minimus (just a handful of addresses).	

Table 12. 2006 Community Natural Gas Usage (therms)

Residential, Commercial and Industrial Propane

This study was not successful at obtaining community propane usage, as it is very difficult to request this information from local providers. Although a few local providers were contacted, and a few did volunteer to provide this information, this data was not forthcoming during the timeframe allotted for this report. It is, therefore, being excluded from the CO_2e emissions totals.

Residential Heating Oil

This study was not successful in obtainment of community heating oil usage. For the same reasons stated above for propane, and also because of time constraints for the production of this report. It is also, therefore, being excluded from the CO_2e emissions totals.

B. TRANSPORTATION

COMMUNITY TRANSPORTATION FOR 2006 **APPROACH III - Average Annual Daily Traffic (AADT)** **NOTE: ADT is for roads within UGB of Lincoln City only.* *This data entered into the CACP V1.1 Community Analysis Transportation Assistant and used to generate VMT.*			
ROAD TYPE	LENGTH* (miles)	Average Annual Daily Traffic (AADT)	Source
LOCAL ROADS	61.51	375	Estimates from City Manager David Hawker. Mar. 27, 2009 Note: Hwy 101 ADT is a weighted average across all segments. All other ADT counts reflect values taken and/or estimated from existing studies conducted by local source data for 2006.
MINOR COLLECTORS		825	
MAJOR COLLECTORS (LOGAN RD., EDLR)		2,600	
TOTAL COLLECTORS/LOCAL ROADS		**3,800**	
LIMITED ACCESS HIGHWAYS (none in LC)	0.00	**0**	
MAJOR ARTERIAL (Hwy 101) SEGMENTS			
North city limits to D River	9.97	18,634	
D River to EDLR			
EDLR to SW 32nd St			
SW 32nd St. to SW 51st St.			
SW 51st St. to South city limits			
MINOR ARTERIAL (WDLR)		3,225	
TOTAL MAJOR ARTERIAL STREETS		**21,859**	

Table 13. 2006 Community Transportation (AADT)

CO_2e emissions data analysis was performed using the Transport Assistant tool within the Community Analysis module within the CACP software. The tool uses the AADT values for each of 3 road types: Limited Access Highways, Major Arterials, and Collectors & Local Streets. It combines these values, taking into account the number of days/year factor (set to 365 to account for the heavy tourist traffic during weekends) with a “typical” average mix of vehicle types and fuels to obtain the Vehicle Miles Traveled (VMT) total. The default mix used by CACP is limited to unleaded gasoline and diesel fuels only, as follows:

Transport Assistant Vehicle Mix (%)		
Vehicle Type	Gasoline (Unleaded)	Diesel
Auto – Full-Size	8.5	-
Auto – Mid-Size	18.7	-
Auto – Subcompact/Compact	33.0	0.3
Heavy Truck	-	5.2
Light Truck/SUV/Pickup	32.4	1.3
Motorcycle	0.4	-

Vanpool	-	-
Transit Bus	-	0.2
Marine	-	-
Rail - Commuter	-	-

Table 14. Transport Assistant Vehicle Mix (%)

The total VMT is then multiplied by the default emissions coefficients, taking into account average fuel consumption rates per vehicle and fuel types, to obtain the total transportation CO_2e contribution.

2006 Community Transportation Vehicle Miles Traveled (Miles)		
Vehicle Type	Gasoline (Unleaded)	Diesel
Auto – Full-Size	14,013,131	-
Auto – Mid-Size	30,828,888	-
Auto – Subcompact/Compact	54,403,920	494,581
Heavy Truck	-	8,572,739
Light Truck/SUV/Pickup	53,414,758	2,143,185
Motorcycle	659,441	-
Vanpool	-	-
Transit Bus	-	329,721
Marine	-	-
Rail - Commuter	-	-

Table 15. 2006 Community Transportation VMT (Miles)

C. WASTE

2006 LINCOLN CITY COMMUNITY SOLID WASTE DISPOSAL HISTORY as furnished by Tina French of North Lincoln Sanitary (Total U.S. Tons transported to the Riverbend Landfill and Recycling Center in McMinnville, Oregon)					
ITEMS SURVEYED	U.S. Tons				
	2003	2004	2005	2006	2007
Papers & Containers - no glass	715.00	774.00	859.00	886.00	934.00
Newspapers/Magazines (ONP)	141.00	156.00	153.00	137.00	137.00
Cardboard/Craft (OCC)	1,067.00	1,182.00	1,174.00	1,164.00	1,147.00
Container Glass (GL)	176.00	192.00	214.00	229.00	246.00
Aluminum (AL)	6.44	10.21	10.33	11.00	3.60
Scrap Metal (SCM)	74.00	73.00	131.00	179.00	133.00
Lead Acid Batteries (LAB)	0.00	1.53	1.94	2.72	3.49
Tires (TIR)	2.17	0.99	1.66	13.32	13.56

Used Motor Oil (OIL)	7.43	5.55	5.11	5.39	5.39
Electronics: Covered Devices (EL CV)	0.00	5.80	10.38	4.57	9.30
Uncompacted Yard Debris (YD)	2,562.00	1,763.00	4,099.00	4,885.00	5,474.00
Other - Copper	1.08	1.74	1.24	1.92	2.53
Other - Carpet Pad	0.00	0.00	0.00	2.31	1.87
TOTAL TONS OF SURVEYED COMMODITIES	4,752.12	4165.82	6660.66	7521.23	8,110.74
TOTAL TONS NOT INCLUDING YARD DEBRIS	2,190.00	2,402.00	2,561.00	2,636.00	2,636.00
TOTAL SOLID WASTE	17,025	18,314	18,706	**21,471**	22,892

NOTE: Surveyed compositions reported here, were not included in the ICLEI-supplied default waste compositions and percentages, and is being reported here for informational purposes only.

Table 16. 2006 Community Solid Waste (U.S. Tons)

D. OTHER

The community sector for “Other” CO_2e emission sources are being reported here for methane (CH_4) and nitrous oxide (N_2O) associated with the community contribution of sewage processing conducted at the city-owned and operated Schooner Creek Waste Water Treatment Plant. The wastewater treatment plant operates aerobically and has CH_4 process emissions in such insignificant and unmeasureable quantities, that it is considered to be de-minimus for this study. It utilizes no co-generation or power generation facilities. It is an aerobically operated system using digesters for the complete breakdown of biological oxygen demand (BOD_5) influents, without subsequent need for methane capture or combustion into the air. The plant does emit a small amount of N_2O due to nitrification/denitrification process loads. There are no treatment lagoons located at the plant for processing BOD_5 loads. The plant does incur a small amount of N_2O process emissions from effluent discharge into Schooner Creek.

There exist fugitive CH_4 process emissions from the community contribution of septic system operations. This was estimated on the number of permitted septic systems in Lincoln City of 806 for 2006, including one owned and operated by the City of Lincoln City at Sand Point Park on Devil’s Lake.

The following equations for the calculation of CH_4 and N_2O emissions are taken from Chapter 10 Wastewater Treatment Facilities in the *ICLEI Local Government Operations Protocol For the Quantification and Reporting of Greenhouse Gas Emissions Inventories Version 1.0 September 2008.*

CH4 from Fugitive Emissions from Septic Systems:

Equation 10.6 CH4 (metric tons) = P * BOD Load * Bo * MCF septic * 365.25 * 0.001

*Population (P)	BOD5 Load	Bo	MCF septic	day/year	metric tons/kg	CH4 (metric tons)
2023	0.09	0.6	0.5	365.25	0.001	19.95032

* population taken from # of permitted septic systems within service area * average # of persons/household (805 * 2.51 = 2023)

** Persons per Household (OREGON) = 2.51, U.S. Census Bureau, 2000 Census Data - http://quickfacts.census.gov/qfd/states/41000.html

N2O from Process Emissions from WWTP with Nitrification/Denitrification:

Equation 10.7 N2O (metric tons) = P * EF nit/denit * 0.000001

*Population (P)	EF nit/denit	grams/ metric ton	N20 (metric tons)
13530	7	0.000001	0.09471

* average annual population served within Public Works WWTP service area

N2O from Process Emissions from Effluent Discharge to Rivers and Estuaries:

Equation 10.10 N2O (metric tons) = P * (Total N Load - N uptake * BOD Load) * EF effluent * 44/12 * (1-Fplant nit/denit) * 365.25 * 0.001

*Population (P)	Total N Load	N uptake aerobic	BOD5 Load	EF effluent	molecular weight ratio N2O to N2 (44/12)	1-F plant nit/denit	days/yr	metric tons/kg	N2O (metric tons)
13530	0.026	0.05	0.09	0.005	1.57	0.3	365.25	0.001	0.250217

* Average annual population served within Public Works WWTP service area

F plant nit/denit = 0.7 for WWTP with nitrification/denitrification

** CAVEAT: No Industrial sources are included in these calculations. Small activities like photo processors, car washes, dry cleaners, etc. are tracked by the city but not reported in this inventory since the municipality was not required under ODEQ to file permits for these during 2006.*

Table 17. 2006 Community CH_4 and N_2O from WWTP BOD_5 Loads